REMARKS

In view of the above amendments and the following remarks, reconsideration of the rejections contained in the Office Action of October 28, 2008 is respectfully requested.

By this Amendment, claims 1-9, 11, 12 and 14-25 have been amended. Thus, claims 1-28 are currently pending in the application. No new matter has been added by these amendments.

Revisions have been made to the specification and abstract. No new matter has been added by the revisions. Entry of the amendments to the specification and abstract is thus respectfully requested.

On page 2 of the Office Action, the Examiner objected to claim 14 under 37 CFR 1.75(c) as being improper for failing to further limit the subject matter of a previous claim. In order to address this objection, it is noted that claim 14 has been amended so as to further limit the subject matter of claim 12. Therefore, it is respectfully submitted that the Examiner's objection is not applicable to amended claim 14.

On pages 2-3 of the Office Action, the Examiner rejected claims 1, 9 and 10 under 35 U.S.C. § 102(b) as being anticipated by Hitoshi (JP 2002-226871). On pages 3-5 of the Office Action, the Examiner rejected claims 2, 23 and 26 under 35 U.S.C. § 103(a) as being unpatentable over Hitoshi in view of Egan (U.S. 3,647,681). On pages 5-8 of the Office Action, the Examiner rejected claims 3-8, 24, 25, 27 and 28 under 35 U.S.C. § 103(a) as being unpatentable over Pilz et al. (U.S. 2002/0113024) in view of Egan. On pages 8-10 of the Office Action, the Examiner rejected claim 11 under 35 U.S.C. § 103(a) as being unpatentable over Hitoshi in view of Egan. On pages 10-15 of the Office Action, the Examiner rejected claims 12-22 under 35 U.S.C. § 103(a) as being unpatentable over Pilz in view of Egan and Hitoshi. For the reasons discussed below, it is respectfully submitted that the present claims are clearly patentable over the prior art of record.

Amended independent claim 1 recites a method of producing sub-critical water decomposition products. The method of claim 1 includes continuously supplying material to be processed into a reactor through an inlet provided for the reactor, whose interior is kept at a sub-critical condition for water. The method of claim 1 also includes *continuously taking out a liquid containing a decomposition product through any one of a plurality of outlets provided at a*

different position from a position where the inlet of the reactor is provided, to adjust residence time of the liquid containing the decomposition product in the reactor.

Hitoshi discloses a gasification reactor which decomposes plastics at high temperature and high pressure. However, Hitoshi does not disclose a method which includes continuously taking out a liquid containing a decomposition product through any one of a plurality of outlets provided at a different position from a position where the inlet of the reactor is provided, as required by independent claim 1, because Fig. 1 of Hitoshi only discloses the reactor 1 as having a single outlet.

Further, it is noted that Hitoshi does not disclose a method which includes continuously taking out a liquid containing a decomposition product through any one of a plurality of outlets provided at a different position from a position where the inlet of the reactor is provided, to adjust residence time of the liquid containing the decomposition product in the reactor, as required by independent claim 1. Accordingly, as Hitoshi does not disclose a method which includes continuously taking out a liquid containing a decomposition product through any one of a plurality of outlets provided at a different position from a position where the inlet of the reactor is provided, to adjust residence time of the liquid containing the decomposition product in the reactor, it is respectfully submitted that Hitoshi does not anticipate independent claim1.

Amended independent claim 2 recites a method of producing sub-critical water decomposition products. The method of claim 2 includes continuously supplying material to be processed into a reactor through an inlet provided for the reactor, whose interior is kept at a sub-critical condition for water, and *continuously taking out a liquid containing a decomposition product through any one of a plurality of outlets provided at a different position from a position where the inlet of the reactor is provided, to form desired steady concentration profiles of the decomposition product in the reactor*. The method of claim 2 also includes taking out the desired decomposition product through at least one of the outlets, the at least one of the outlets being provided at a position where the concentration of the desired decomposition product is high.

As discussed above, Hitoshi discloses a gasification reactor which decomposes plastics at high temperature and high pressure, but does not disclose a method which includes continuously taking out a liquid containing a decomposition product through any one of a plurality of outlets

provided at a different position from a position where the inlet of the reactor is provided, as required by independent claim 2, because Fig. 1 of Hitoshi only discloses the reactor 1 as having a single outlet.

In addition, Hitoshi does not disclose continuously taking out a liquid containing a decomposition product through any one of a plurality of outlets provided at a different position from a position where the inlet of the reactor is provided, to form desired steady concentration profiles of the decomposition product in the reactor, as required by independent claim 2.

Egan discloses a catalytic dewaxing method in which a high molecular-weight hydrocarbon is decomposed into a low molecular weight hydrocarbon in a hydrogenation decomposition zone containing a dewaxing catalyst, and that the decomposed hydrocarbons are subsequently separated based on molecular weight in a separation zone.

On page 4 of the Office Action, the Examiner notes that Egan discloses a chemical reactor having multiple outlets. However, it is noted that Egan discloses a separation zone 5 which has multiple outlets. In this regard, it is noted that the separation zone 5 is not a "reactor," because the components are separated in the separation zone 5 according to molecular weight, and not by a reaction. Egan also discloses that a high molecular-weight hydrocarbon is decomposed into a low molecular weight hydrocarbon in a hydrogenation decomposition zone containing a dewaxing catalyst (*i.e.*, the catalytic dewaxing zone 12). However, Egan only discloses that the catalytic dewaxing zone 12 has a single outlet. Thus, Egan does not disclose a method which includes continuously taking out a liquid containing a decomposition product through any one of a plurality of outlets of the reactor provided at a different position from a position where the inlet of the reactor is provided, as required by independent claim 2.

Further, Egan does not disclose continuously taking out a liquid containing a decomposition product through any one of a plurality of outlets provided at a different position from a position where the inlet of the reactor is provided, to form desired steady concentration profiles of the decomposition product in the reactor, as required by independent claim 2.

Accordingly, as none of the Hitoshi and Egan references discloses a method which includes continuously taking out a liquid containing a decomposition product through any one of a plurality of outlets provided at a different position from a position where the inlet of the reactor is provided, to form desired steady concentration profiles of the decomposition product in the

reactor, as required by independent claim 2, it is respectfully submitted that the combination of the Hitoshi and Egan references does not disclose or suggest the method of independent claim 2.

Amended independent claim 3 recites a method of producing sub-critical water decomposition products. The method of claim 3 includes continuously supplying material to be processed that contains solid matter having a slow decomposition rate with sub-critical water and a different specific gravity from that of the sub-critical water, into a vertical-type reactor whose interior is kept at sub-critical conditions for water, through an inlet provided for the reactor. The method of claim 3 also includes *selecting an outlet from which a liquid containing a decomposition product is let out and adjusting an outlet amount thereof, to make a steady flow in the sub-critical water in a steady state with a plurality of outlets provided at a position different in height from where the inlet is provided for the reactor*, with the steady flow flowing in an opposite direction to a direction in which the solid matter sinks or floats up and being slower than a sinking velocity or floating velocity of the solid matter.

The method of claim 3 also includes forming in the steady flow, in the following order from upstream of the flow, at least a fluidized bed in which the solid matter is decomposed into fine particles by the sub-critical water and the fine particles fluidize in the flow, and a sub-critical water dissolution part in which the material to be processed is turned into further finer particles or completely turned into a soluble material to flow with the sub-critical water, and further forming, depending on a type of the material to be processed, a fixed bed in which solid matter stays in a fixed location even with the flow, with the fixed bed being formed upstream of the fluidized bed. Claim 3 also recites taking out the liquid containing a desired decomposition product from the sub-critical water dissolution part from the reactor, using at least one of the outlets.

Pilz discloses a method for supercritical wet oxidation which, as shown in Fig. 5, includes supplying supercritical water to a vessel 2 through a conduit 4, and introducing solids into the vessel 2 through an inlet 22. Pilz also discloses that the vessel 2 includes an outlet 24 for the removal of solids, a vertical separation wall 26 and a horizontal separation wall 28.

As noted by the Examiner on page 6 of the Office Action, Pilz does not disclose a method which includes selecting an outlet from which a liquid containing a decomposition product is let out and adjusting an outlet amount thereof, to make a steady flow in the sub-critical water in a

steady state with a plurality of outlets provided at a position different in height from where the inlet is provided for the reactor, as required by independent claim 3.

Further, Pilz does not disclose selecting an outlet from which a liquid containing a decomposition product is let out and adjusting an outlet amount thereof, to make a steady flow in the sub-critical water in a steady state with a plurality of outlets provided at a position different in height from where the inlet is provided for the reactor, as required by independent claim 3. In this regard, as discussed above, it is noted that Pilz discloses that the supercritical water is supplied from the bottom of the vessel 2 via the conduit 4. Thus, the supercritical water is supplied in an upward direction on both sides of the vertical separation wall 26. Further, Pilz discloses that the solids are supplied separately into the vessel 2 through the inlet 22 at the left side of the vessel 2 (as shown in Fig. 5). Therefore, the upward flow of the supercritical water opposes the direction of sedimentation on the left side of the vertical separation wall 26, and is parallel to the direction of the floating solid matter on the right side of the vertical separation wall 26. Accordingly, it is respectfully submitted that Pilz does not disclose or suggest selecting an outlet from which a liquid containing a decomposition product is let out and adjusting an outlet amount thereof, to make a steady flow in the sub-critical water in a steady state, as required by independent claim 3.

In addition, Pilz does not disclose selecting an outlet from which a liquid containing a decomposition product is let out and adjusting an outlet amount thereof, to make a steady flow in the sub-critical water in a steady state with a plurality of outlets provided at a position different in height from where the inlet is provided for the reactor, as required by independent claim 3. Rather, Pilz only discloses that the heights of the inlet 22 (for introducing the material to be processed) and the outlet 24 are substantially equal to each other in Fig. 5, and is otherwise silent as to the relative heights of the inlet 22 and the outlet 24.

On page 6 of the Office Action, the Examiner cites Egan as disclosing a chemical reactor having multiple outlets. However, as indicated above, it is noted that Egan discloses a separation zone 5 which has multiple outlets. In this regard, it is noted that the separation zone 5 is not a "reactor," because the components are separated in the separation zone 5 according to molecular weight, and not by a reaction. Egan also discloses that a high molecular-weight hydrocarbon is decomposed into a low molecular weight hydrocarbon in a hydrogenation decomposition zone

containing a dewaxing catalyst (*i.e.*, the catalytic dewaxing zone 12). However, Egan only discloses that the catalytic dewaxing zone 12 has a single outlet. Thus, Egan does not disclose a method which includes selecting an outlet from which a liquid containing a decomposition product is let out and adjusting an outlet amount thereof, to make a steady flow in the sub-critical water in a steady state with a plurality of outlets provided at a position different in height from where the inlet is provided for the reactor, as required by independent claim 3.

Further, Egan also does not disclose a method which includes selecting an outlet from which a liquid containing a decomposition product is let out and adjusting an outlet amount thereof, to make a steady flow in the sub-critical water in a steady state with a plurality of outlets provided at a position different in height from where the inlet is provided for the reactor, as required by independent claim 3.

Accordingly, as none of the Pilz and Egan references discloses a method which includes selecting an outlet from which a liquid containing a decomposition product is let out and adjusting an outlet amount thereof, to make a steady flow in the sub-critical water in a steady state with a plurality of outlets provided at a position different in height from where the inlet is provided for the reactor, as required by independent claim 3, it is respectfully submitted that the combination of the Pilz and Egan references does not disclose or suggest the method of independent claim 3.

Amended independent claim 4 recites a method of producing sub-critical water decomposition products. The method of claim 4 includes *supplying a mixture including an object containing solid matter and subcritical water into a reaction container through a same inlet and causing the mixture to flow in sub-critical water in a steady state in an opposite direction to a direction in which the solid matter flows*. The method of claim 4 also includes forming in the flow, in the following order from upstream of the flow, at least a fluidized bed in which the solid matter is decomposed into fine particles by the sub-critical water and the fine particles fluidize in the flow, and a sub-critical water dissolution part in which the material to be processed is turned into further finer particles or completely turned into a soluble material to flow with the sub-critical water. Further, the method of claim 4 includes further forming, depending on a type of the material to be processed, a fixed bed in which solid matter stays in a fixed location even with the flow, the fixed bed being formed upstream of the fluidized bed, and

adjusting a distance through which the sub-critical water dissolution part flows to vary a residence time of the solid matter and a residence time of the sub-critical water from each other and to adjust a degree of decomposition of the components of the material to be processed that have been made soluble to the sub-critical water, whereby a target decomposition treatment product is obtained.

As indicated above, Pilz discloses a method for supercritical wet oxidation which, as shown in Fig. 5, includes supplying supercritical water to a vessel 2 through a conduit 4, and introducing solids into the vessel 2 through an inlet 22. However, Pilz does not disclose supplying a mixture including an object containing solid matter and subcritical water into a reaction container through a same inlet, as required by independent claim 4, because Pilz discloses individually introducing solid matter and supercritical water through separate inlets 4 and 22.

Further, Pilz does not disclose *adjusting a distance through which the sub-critical water dissolution part flows to vary a residence time of the solid matter and a residence time of the sub-critical water from each other*, as required by independent claim 4. In this regard, it is noted that the distance between the inlet 4 of the fluid and the outlet 24 of the fluid in Pilz is a fixed distance, and thus Pilz does not disclose or suggest adjusting a distance through which the sub-critical water dissolution part flows to vary a residence time of the solid matter and a residence time of the sub-critical water from each other, as required by independent claim 4.

Egan discloses a catalytic dewaxing method in which a high molecular-weight hydrocarbon is decomposed into a low molecular weight hydrocarbon in a hydrogenation decomposition zone containing a dewaxing catalyst, and that the decomposed hydrocarbons are subsequently separated based on molecular weight in a separation zone. However, Egan does not disclose or suggest *adjusting a distance through which the sub-critical water dissolution part flows to vary a residence time of the solid matter and a residence time of the sub-critical water from each other*, as required by independent claim 4.

Accordingly, as none of the Pilz and Egan references discloses a method which includes adjusting a distance through which the sub-critical water dissolution part flows to vary a residence time of the solid matter and a residence time of the sub-critical water from each other, as required by independent claim 4, it is respectfully submitted that the combination of the Pilz

and Egan references does not disclose or suggest the method of independent claim 4.

Amended independent claim 11 recites an apparatus for sub-critical water decomposition treatment, comprising a reactor configured to decompose material to be processed using sub-critical water, heating means for heating a mixture composed of water and the to be processed material to form and keep sub-critical conditions for water, and compressing means for compressing the mixture. Further, claim 11 recites introducing means for introducing the material to be processed into the reactor, an inlet through which the material to be processed is to be introduced into the reactor, and an outlet for letting out a mixture of a decomposition product and water from the reactor, wherein the outlet is provided at at least one of a plurality of positions different from a position where the inlet is provided, so that the outlet can take up a plurality of positions.

Hitoshi discloses a gasification reactor which decomposes plastics at high temperature and high pressure. However, as acknowledged by the Examiner on page 9 of the Office Action, Hitoshi does not disclose an outlet for letting out a mixture of a decomposition product and water from the reactor, wherein the outlet is provided at at least one of a plurality of positions different from a position where the inlet is provided, so that the outlet can take up a plurality of positions, as required by independent claim 11.

On page 9 of the Office Action, the Examiner cites Egan as disclosing a chemical reactor having multiple outlets. However, as indicated above, it is noted that Egan discloses a separation zone 5 which has multiple outlets. In this regard, it is noted that the separation zone 5 is not a "reactor," because the components are separated in the separation zone 5 according to molecular weight, and not by a reaction. Egan also discloses that a high molecular-weight hydrocarbon is decomposed into a low molecular weight hydrocarbon in a hydrogenation decomposition zone containing a dewaxing catalyst (*i.e.*, the catalytic dewaxing zone 12). However, Egan only discloses that the catalytic dewaxing zone 12 has a single outlet. Thus, Egan does not disclose an outlet for letting out a mixture of a decomposition product and water from the reactor, wherein the outlet is provided at at least one of a plurality of positions different from a position where the inlet is provided, so that the outlet can take up a plurality of positions, as required by independent claim 11.

Accordingly, as none of the Hitoshi and Egan references discloses an outlet for letting out

a mixture of a decomposition product and water from the reactor, wherein the outlet is provided at at least one of a plurality of positions different from a position where the inlet is provided, so that the outlet can take up a plurality of positions, as required by independent claim 11, it is respectfully submitted that the combination of the Hitoshi and Egan references does not disclose or suggest the apparatus of independent claim 11.

Amended independent claim 12 recites an apparatus for sub-critical water decomposition treatment, which includes a vertical-type reactor configured to decompose material to be processed with sub-critical water, heating means for heating a mixture of water and the material to be processed and compressing means for compressing the mixture, so as to form and keep a sub-critical condition for water, and introducing means for introducing the material to be processed into the reactor. Further, claim 12 recites an inlet through which the material to be processed is to be introduced into the reactor, and an outlet for letting out a mixture of water and a decomposition product from the reactor.

In addition, claim 12 recites that the reactor is arranged substantially vertically, the inlet is provided for at least one of a top end portion or a bottom end portion of the reactor, and that the introduced mixture of the material to be processed and the sub-critical water is caused to flow, in the sub-critical water in a steady state, in an opposite direction to a direction in which the solid matter travels, so as to form in the flow, in the following order from upstream of the flow, at least a fluidized bed in which the solid matter is decomposed into fine particles with the sub-critical water and the fine particles fluidize in the flow, and a sub-critical water dissolution part in which the material to be processed is turned into further finer particles or completely into a soluble material to flow with the sub-critical water, and to further form, depending on the material to be processed, a fixed bed in which solid matter stays in a fixed position even with the flow, the fixed bed being formed upstream of the fluidized bed. Further, claim 12 recites that *a position of the outlet is adjustable so as to let out the sub-critical water dissolution part and adjust a distance through which the sub-critical water dissolution part flows*.

Pilz discloses a method for supercritical wet oxidation which, as shown in Fig. 5, includes supplying supercritical water to a vessel 2 through a conduit 4, and introducing solids into the vessel 2 through an inlet 22. However, as indicated by the Examiner on page 11 of the Office Action, Pilz does not disclose a heating and pressurizing means, and does not disclose that

a position of the outlet is adjustable so as to let out the sub-critical water dissolution part and adjust a distance through which the sub-critical water dissolution part flows, as required by independent claim 12.

On page 11 of the Office Action, the Examiner cites Hitoshi as disclosing a heating and pressurizing means. However, as indicated above, Hitoshi only discloses the reactor 1 as having a single outlet, and does not disclose that *a position of the outlet is adjustable so as to let out the sub-critical water dissolution part and adjust a distance through which the sub-critical water dissolution part flows*, as required by independent claim 12.

Further, on page 11 of the Office Action, the Examiner cites Egan as disclosing a chemical reactor having multiple outlets. However, as indicated above, it is noted that Egan discloses a separation zone 5 which has multiple outlets. In this regard, it is noted that the separation zone 5 is not a "reactor," because the components are separated in the separation zone 5 according to molecular weight, and not by a reaction. Egan also discloses that a high molecular-weight hydrocarbon is decomposed into a low molecular weight hydrocarbon in a hydrogenation decomposition zone containing a dewaxing catalyst (*i.e.*, the catalytic dewaxing zone 12). However, Egan only discloses that the catalytic dewaxing zone 12 has a single outlet. Thus, Egan does not disclose that *a position of the outlet is adjustable so as to let out the sub-critical water dissolution part and adjust a distance through which the sub-critical water dissolution part flows*, as required by independent claim 12.

Accordingly, as none of the Pilz, Hitoshi and Egan references discloses that *a position of the outlet is adjustable so as to let out the sub-critical water dissolution part and adjust a distance through which the sub-critical water dissolution part flows*, as required by independent claim 12, it is respectfully submitted that the combination of the Pilz, Hitoshi and Egan does not disclose or suggest the apparatus of independent claim 12.

Therefore, it is respectfully submitted that independent claims 1-4, 11 and 12, as well as claims 5-10 and 13-28 which depend therefrom, are clearly allowable over the prior art of record.

In view of the foregoing amendments and remarks, it is respectfully submitted that the present application is clearly in condition for allowance. An early notice to that effect is respectfully solicited.

If, after reviewing this Amendment, the Examiner feels there are any issues remaining which must be resolved before the application can be passed to issue, the Examiner is respectfully requested to contact the undersigned by telephone in order to resolve such issues.

Respectfully submitted,

Hiroyuki YOSHIDA

/Walter C. Pledger/
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By:_____
Walter C. Pledger
Registration No. 55,540
Attorney for Applicant

WCP/lkd
Washington, D.C. 20005-1503
Telephone (202) 721-8200
Facsimile (202) 721-8250
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